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The Construction Forum

from the Field to the Field

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1. The Construction Forum (CF) is a newsletter-type publication which provides the field with a means for expressing their views, questions, suggestions, and particularly significant lessons learned. Articles are submitted to HQUSACE Construction Division (CEMP-CP) for publication. The CF is published as often as needed.

2. The following article on placement and finishing of concrete on elevated slabs was submitted to the Construction Forum by Mr. William Hamel of the Construction Division of the Baltimore District, North Atlantic Division:

a. Background: For the placement and finishing of concrete on elevated slabs (bridge decks, parking garage floors, etc.) requiring tight tolerances for grade and smoothness, proper planning is essential to preclude deficiencies. All too often, we might have a tendency to underestimate this as another routine concrete operation. However, without certain precautions, there is a high probability for deficiencies. The contractor should be prepared to identify the specific measures that will be employed to ensure satisfactory placement procedures. The Quality Assurance personnel must be knowledgeable of the proper practices that need to be considered and addressed at the preparatory inspection.

b. Although the specifications stipulate the technical requirements for this operation, in addition to the standard considerations for concrete placements, specific items related to elevated slabs that should be addressed at the preparatory inspection include the following:

(1) Concrete placement plan.

(a) The size of proposed placements and location of end joints should be identified to ascertain that the quantity of concrete slab to be placed is not too large. The direction of placement and the staggering of placements may need to be considered in the case of slabs over continuous beams. The limits of placement (location of the end joints) should be approved by the designer if the size of the placement is to differ from that shown on the drawings. For slab/deck concrete, it is important to be able to maintain an acceptable forward rate of placement that will enable the concrete to be placed, screeded, floated, finished and cured within a timely fashion.

(b) If the concrete is not to be placed full width of the deck, a side form should be utilized. If the proposed side construction joint is not identified on the drawings, the proposed location should be reviewed by the designer.

(c) The drawings for a bridge deck will often show a concrete placement pattern which requires construction joints. This pattern should be followed, since less stress will be introduced into the concrete already placed and hardened when the beams are deflected by weight of the new concrete. Because of the deflection of the beams, ideally the first batch of concrete placed in a portion of the slab between the construction joints should still be plastic when the last batch in that portion is placed.

(2) Method of transporting the concrete to the deck.

(a) The concrete delivered to the deck should be uniform in composition, workability and consistency. It should be placed in the forms without segregation and as close as possible to its final position. Forms should be in place and sufficiently tight and secured to prevent movement and the leakage of concrete outside of the form.

(b) Crane and Bucket placements result in a slow operation especially if the crane operator is unable to see the discharge point of the bucket and must be directed by hand signals. The size of the bucket should be as large as possible. However, care should be employed to ensure that too much concrete will not be dumped in one area and from a height which could result in damage to the deck pans/forms.

(c) Pumping is the usual preferred method of transporting concrete to the deck. Pumping allows the concrete to be spread more uniformly and reduces the amount of work required in the spreading and screeding operation. Precautions must be exercised when using pumps to ensure that the air entrainment percentage is not affected when pumping is employed. Air entrainment tests should be accomplished from concrete obtained at the pump discharge.

(3) Screeding/finishing.

(a) Screeding should be accomplished using side forms or pipe-type rails as the guide for the screed, to maintain the proper grade. Screed supports should be located over beams or parapet forms and not over the deck pans/forms. The screed supports should be surveyed to accommodate proper grade. Adjustable pipe supports for the screed rail offers the best method of achieving the required grade elevations. These guides are usually removed as soon as screeding is complete when the concrete is still plastic. The screed itself should always be checked for proper cross-section and straightness before concrete is placed. The profile of the finished deck depends on the setting of the screed guides or rails.

(b) Consideration of dead load deflection may be necessary in achieving the required grades for the setting of the screed guides. This depends on the elevations of the beams or girders after erection, the camber in the beams, the deflections anticipated for the dead load of the concrete, the required elevations of the finished surface and the thickness of the deck slab. This information will have to be considered into the surveyed adjustment of the screed support.

(c) Mechanical screeds/finishing machines are the best method of screeding and finishing slab concrete. A floating screed (without fixed guides) is not an acceptable practice for achieving tight grade/smoothness tolerances.

(d) Hand finishing may result in wavy concrete. A long straight edge should be used to check for the required smoothness tolerance.

(4) If the weather is windy and hot, the contractor should consider postponing the placement of the concrete because the surface of the concrete will dry out fast and getting a good finish will be difficult. If the contractor will not postpone, he must provide windbreaks, shading, or fogging.

(5) Workers should be experienced and be equipped with the proper tools. Because of the viability of the finished project and the unforgiving nature of the concrete, this feature of work should not be used as a training area for new workers. Workers should demonstrate a familiarity with their assigned task. Fogging mist above the surface of the concrete to increase the humidity may be employed to retard surface evaporation. A proper fogger must be employed and precautions should be in place to preclude working additional water into the surface of the concrete.

(6) It is important to maintain the concrete coverage over the top layer of reinforcing steel. Bridge decks or parking garages subjected to salting for ice control are susceptible to corrosion of the top layer of reinforcing steel. This is a result of the chloride penetration into the concrete and rusting of the reinforcing steel. During the placement, steel cover depth checks should be continuously taken with a ruler to ensure that the steel coverage is being maintained. Subsequently, pachometer or cover meter checks can be performed on the hardened concrete to document actual in-place cover. If problems are noted, adjustments in the future placement procedures will have to be initiated to preclude further defects. Inadequate cover for top steel may be the result of many factors including, supporting beam deflections, improperly tied steel, and inadequate screed rail supports.

(7) Curing provisions should be on hand prior to the start of work. If a curing compound is used, it should be applied as soon as bleed water has disappeared.

(8) Bulkhead provisions should be on hand in the event that problems require the stoppage of work and the forming of an unanticipated joint.

c. In the event that a preparatory inspection is being scheduled for a deck/slab placement, please ensure that the quality assurance personnel are fully knowledgeable of proper placement procedures necessary to achieve quality concrete placements. Assistance from the District Office is available and should be solicited in the event that qualified, experienced slab/deck personnel are not available at the project.

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